PROJECT MANAGEMENT

18ME761-OE

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BOOKS

1. **S Choudhary, "Project Management"** Tata McGraw Hill Education Private Limited New Delhi.

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2. Harold Kerzner, "Project Management: A Systems Approach To Planning, Scheduling And Controlling ", CBS publisher and distributers

3. L S Srinath " PERT and CPM Principles and Applications" Third Eddition

4. Dr. P N Modi "PERT and CPM"

Delegation

- What to delegate?
- When to delegate?
- How to delegate?

- **Project managers authority**

TYPES OF PROJECT ORGANIZATION

- Project manager staff assisting to chief executive
- Project management as staff specialized staff function
- Matrix organization
- Task force organization
- Totally projectized organization

Project manager staff assisting to chief executive

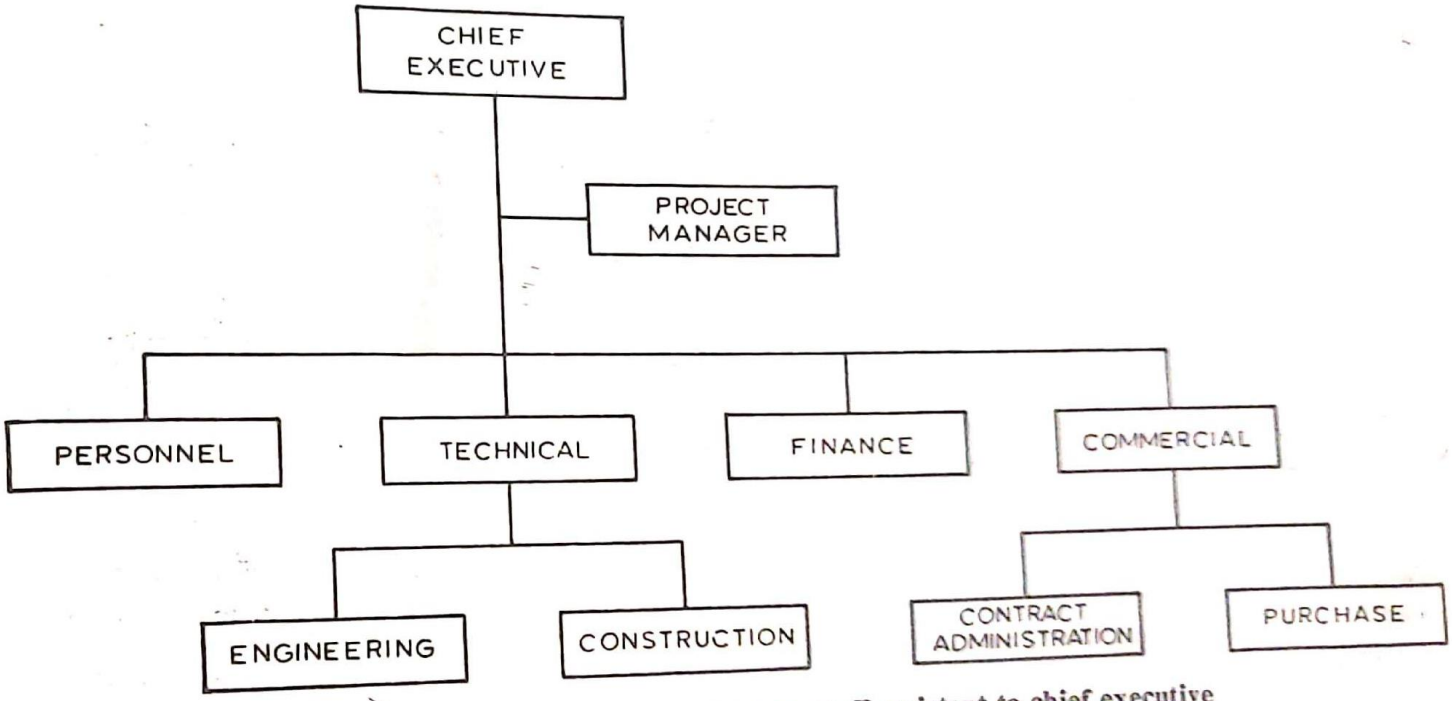


FIG. 3.2 Project manager as a staff assistant to chief executive

Project management as staff specialized staff function

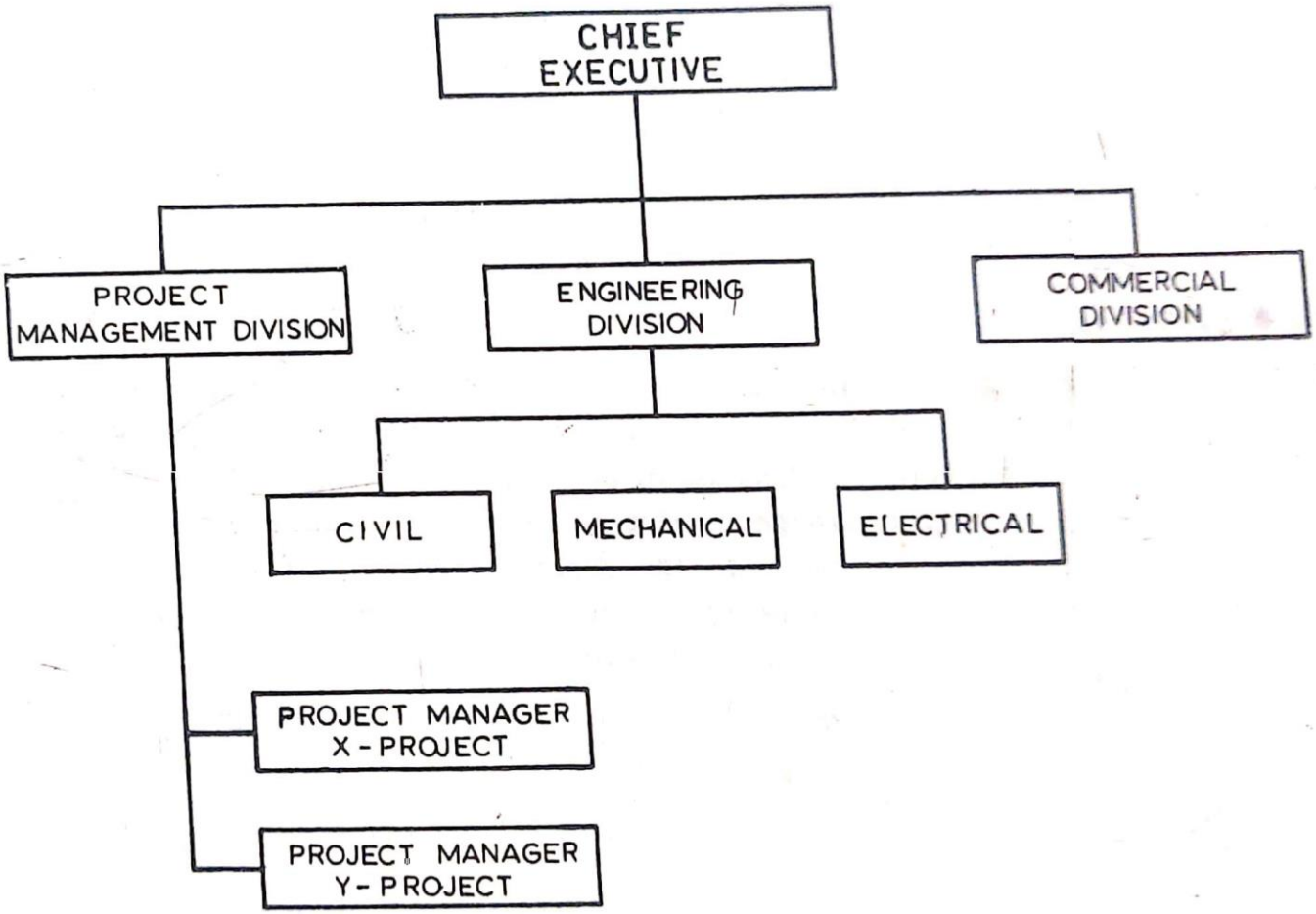


FIG. 3.3 Project management as a specialised staff function

Matrix organization

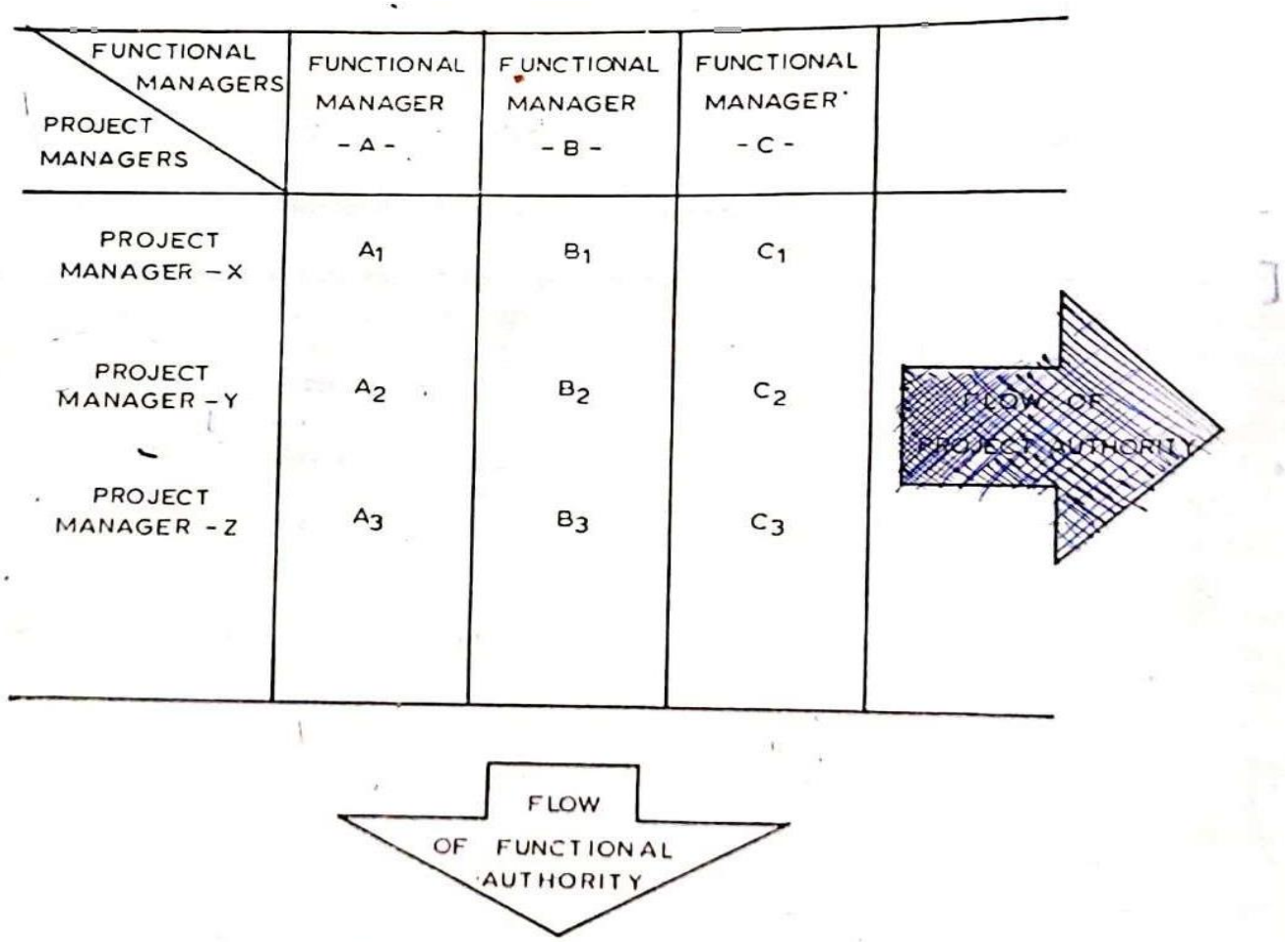


FIG. 3.4 Concept of matrix organisation

Matrix organization

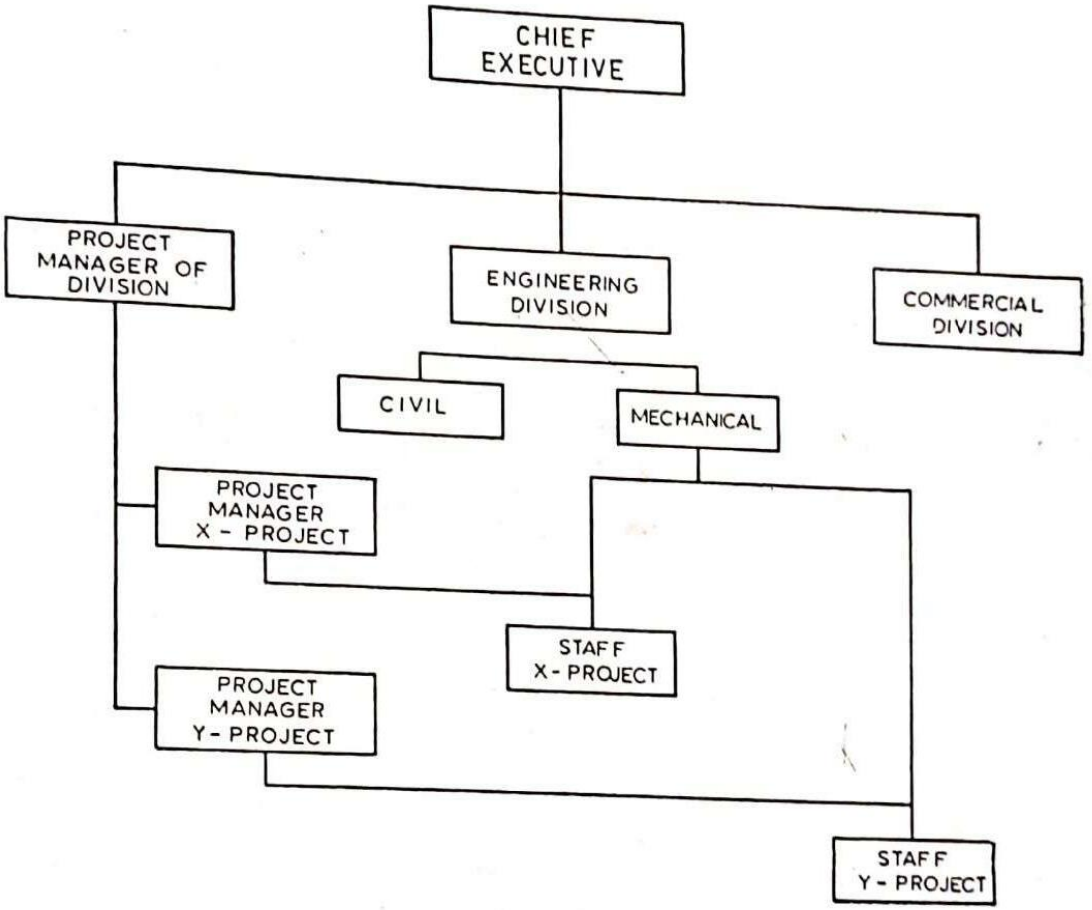


FIG. 3.5 Matrix organisation

MATRIX ORGANISATION

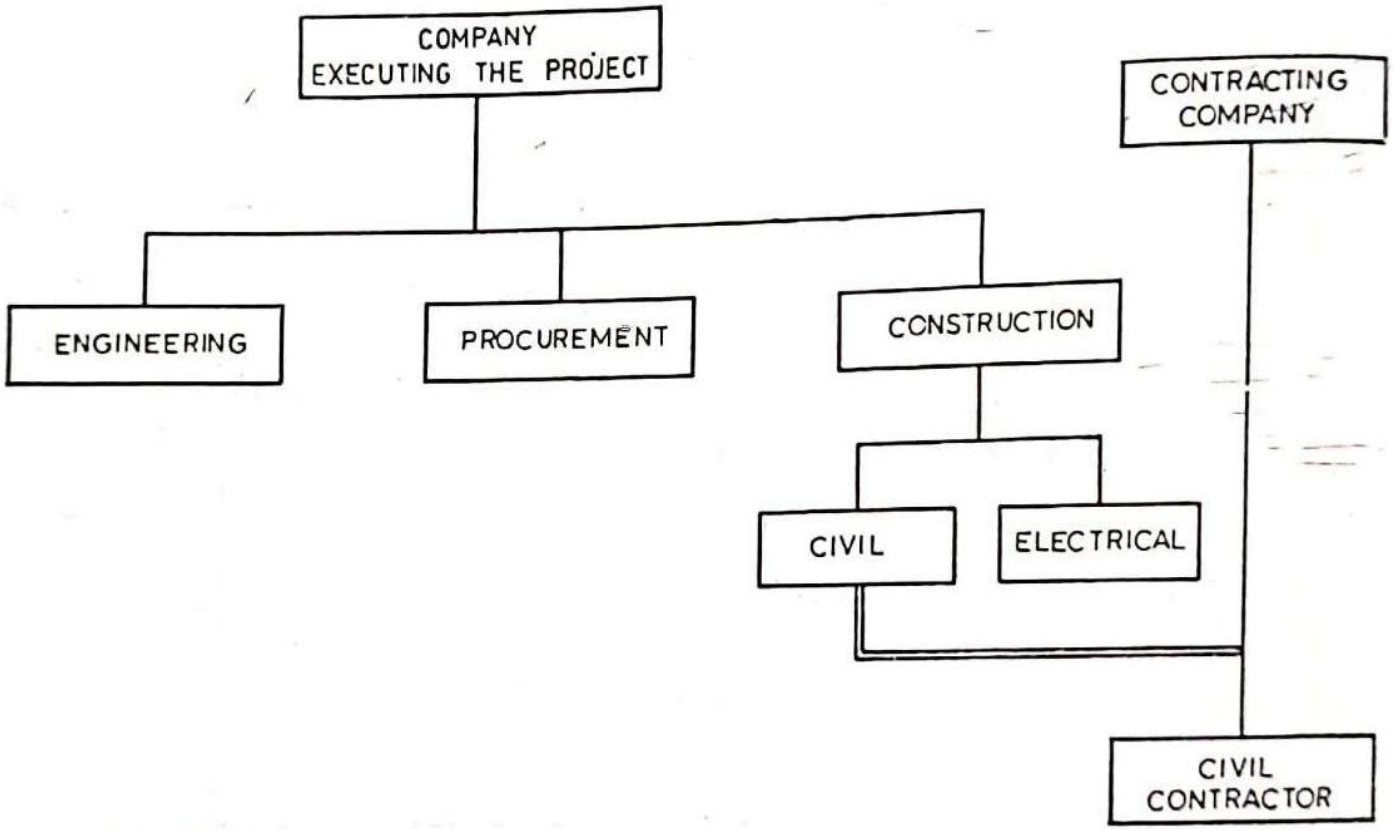


FIG. 3.6 Matrix arrangement in operation in execution of contracts

MATRIX ORGANISATION

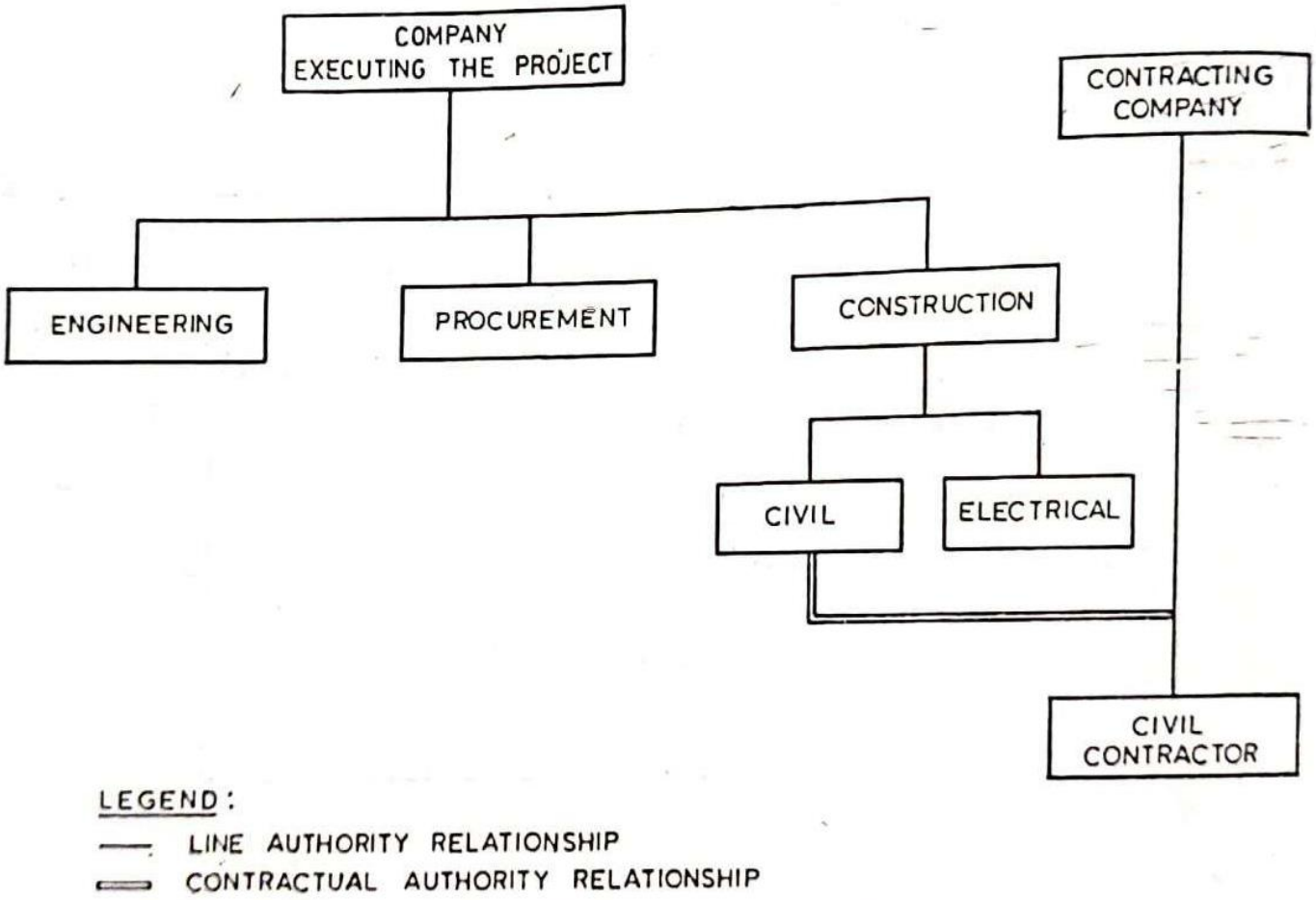


FIG. 3.6 Matrix arrangement in operation in execution of contracts

Task force organisation

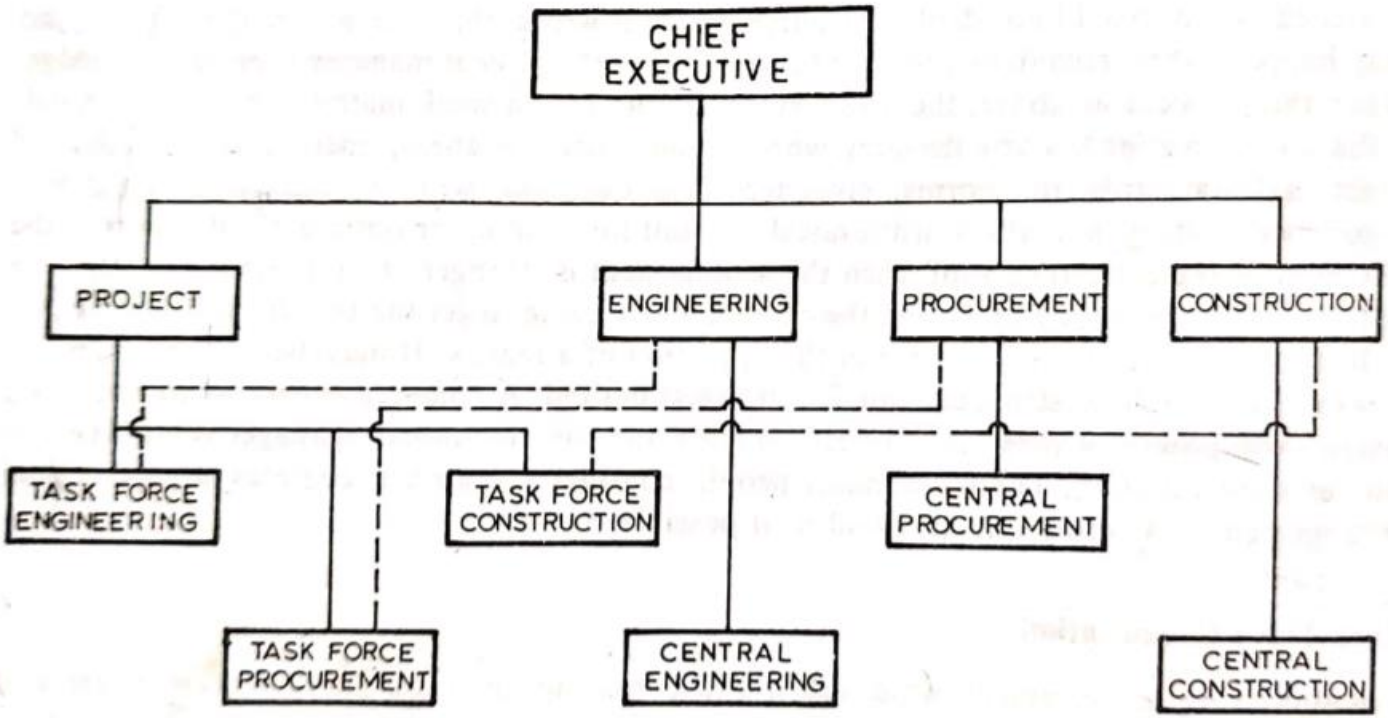


FIG. 3.7 Task force arrangement

TOTALLY PROJECTIZED ORGANISATION

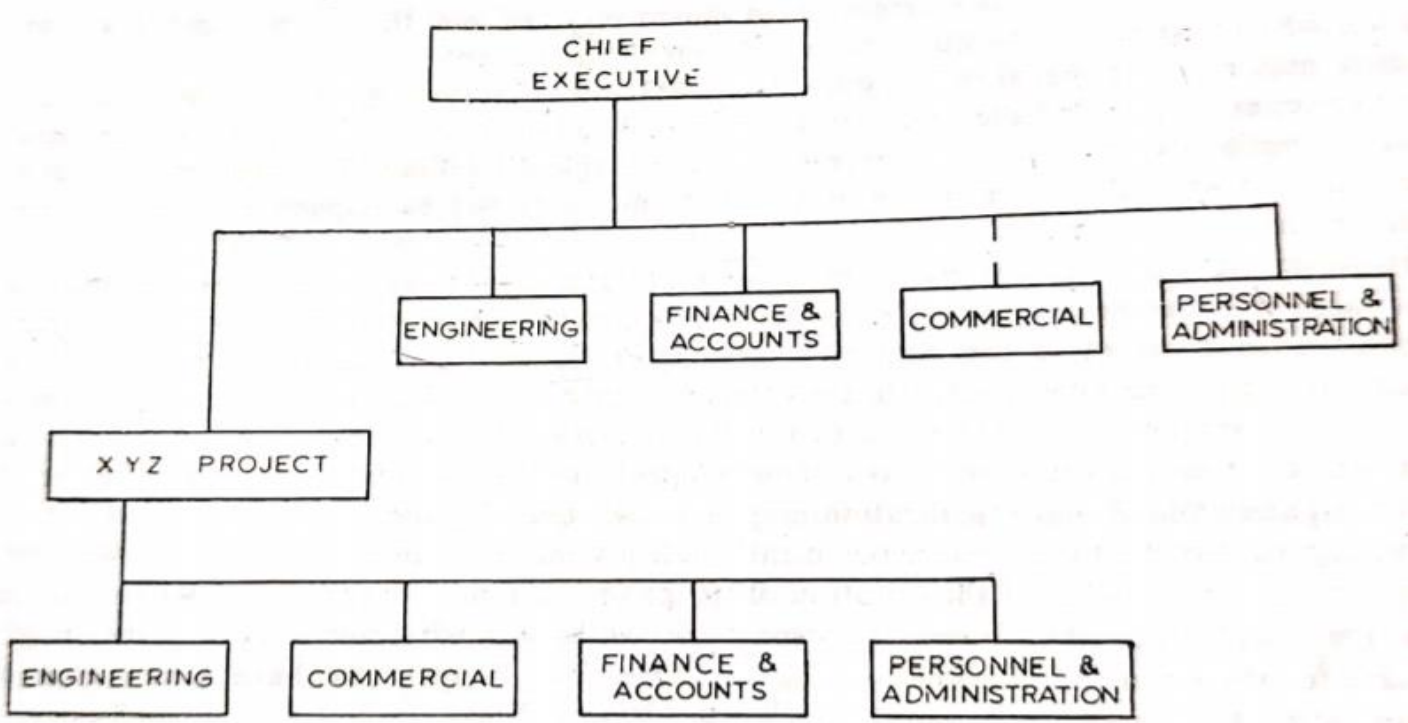


FIG. 3.8 Totally projectized organisation

TABLE 3.1 Authority—accountability with various organization

S. No.	Type of arrangement	Authority		Accountability	
		Project Manager	*Functional Manager*	*Project Manager*	*Functional Manager*
1.	Project manager as a staff	Does not make any decision for the project, collates and communicates information.	Decides what has to be done, how it has to be done, when and at what cost in their functional area.	Cannot be held accountable for any performance parameter of the project. Accountable for timely reporting.	Can be held accountable for individual functional performance. Cannot be held accountable for overall project time and cost.
2.	Consultant as a project manager	Does not make decisions, betters systems, procedures, and guidelines for project implementation. Trains staff, monitors implementation and makes recommendations.	Same as above.	Same as above.	Same as above.
3.	Project management as a staff function	Decides on overall schedules to be followed and budgets to be provided but cannot direct staff for adherence to the same.	Decides what has to be done, how it is to be done, when it has to be done and at what cost in their functional area.	Cannot be held accountable for time and cost but can be held accountable for proper coordination.	Can be held accountable for functional performance of the project. Cannot be held accountable for overall project time and cost.
4.	Matrix organisation	Decides on what is to be done, when it is to be and at what cost for the entire project. Can direct for adherence to the same.	Decides on how it is to be done in their functional area. Can direct implementation of above.	Can be held accountable for time and cost of the overall project but cannot be held accountable for technical performance.	Can be held accountable for technical performance in their functional area.
5.	Task force	Decides what is to be done, when it is to be done, how it is to be done and at what cost for the entire project. Directs the entire project in all aspects of the project. Does not recruit,	Provides staff for task force and guidelines as to how the functions are to be performed in the task force. Can direct adherence to the guidelines.	Can be held accountable for time, cost and technical performance of the project.	Can be held accountable for adequacy of staffing both qualitatively and quantitatively for effective functioning of the task force. Cannot be held accountable for any performance parameter of the project.

		train or involve in corporate administrative matters.			
6.	Totally projectized organization	Decides everything for the project including corporate administrative matters. Authority matches with that of the chief executive of the company.	Is not involved in any decision making for the project.	Is accountable for all performance parameters of the project and for all administrative matters of the project organization.	Not accountable for thing related to the pro

Contractors

- In house resources – project manage has authority
- For execution of project -- extra organizational resources

- Contract – is an agreement between two or more parties in writing, to do or not to do certain things.

CONTRACTORS

Enquiry	–Issue of NIT to selected parties or to the newspapers by the project authority and sale of tender document
↓	
Offer	–Submission of the tender document by the bidder
↓	
Acceptance	–Communication from the recipient of the offer to the bidder indicating intent to enter into an agreement and acceptance of the same by the bidder
↓	
Agreement	–Offer and considerations as accepted given a legal form and content duly signed by competent authorities of both parties
↓	
Contract	–The contract consists of an agreement on stamped paper, a detailed letter of intent with agreed variations and the original tender document

3 R ‘s of contacting

1. Responsibility
2. Reimbursement
3. Risk

- Responsibility

Responsibilities

S. No.	Scope of work	Responsibilities		
		Owner	Engineering Contractor	Third party
1.	Process design	√	=	√
2.	Basic engineering	=	√	=
3.	Detailed engineering	×	√	×
4.	Procurement services	=	√	=
5.	Equipment supply	=	√	√
6.	Sub-contracting services	=	√	×
7.	Commissioning	√	=	√
8.	Project management	√	√	×
9.	Construction management	=	√	×
10.	Financing	√	×	×

Legend: √ Assume full responsibility
× Does not assume responsibility
= May sometimes assume responsibility

Responsibility matrix

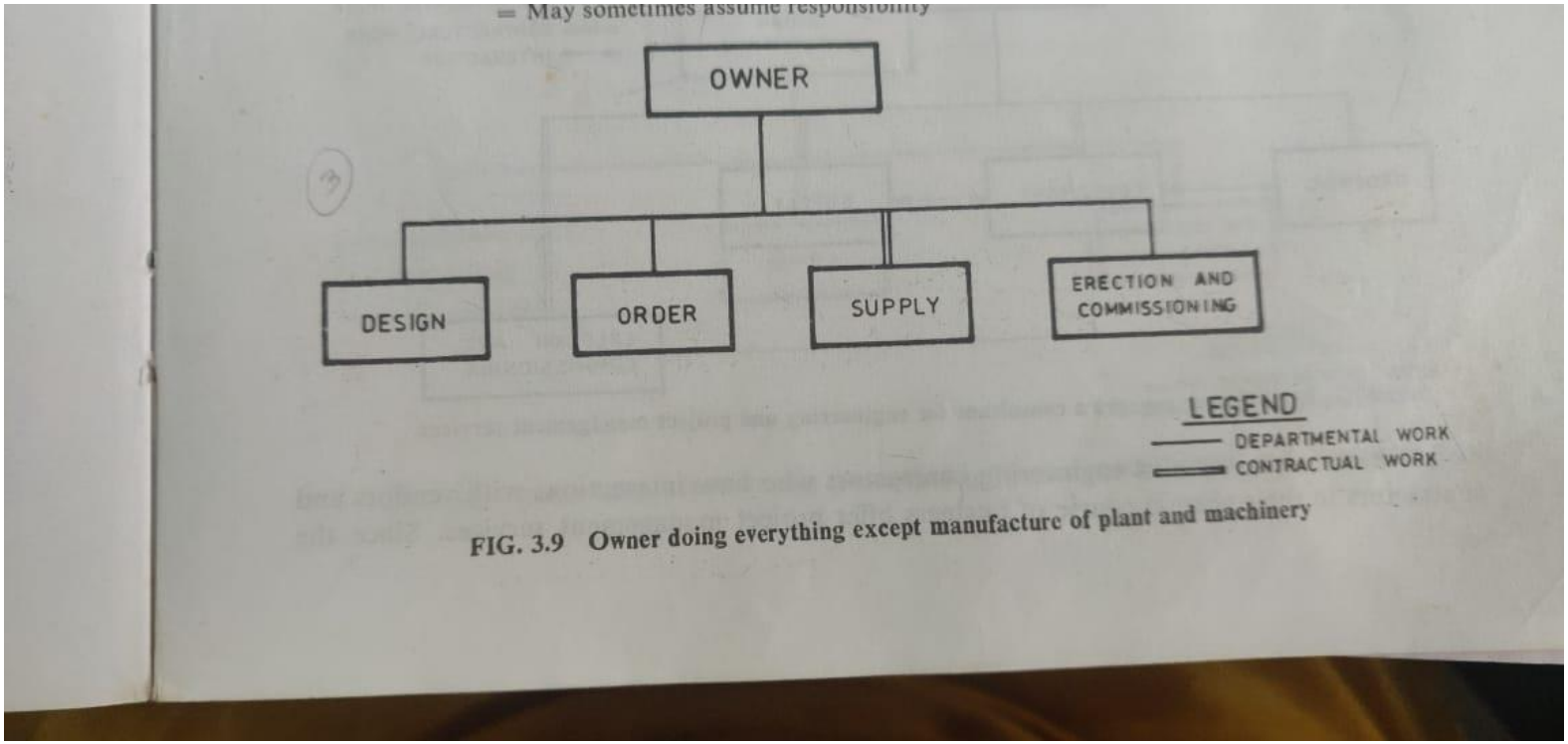


FIG. 3.9 Owner doing everything except manufacture of plant and machinery

RESPONSIBILITY MATRIX

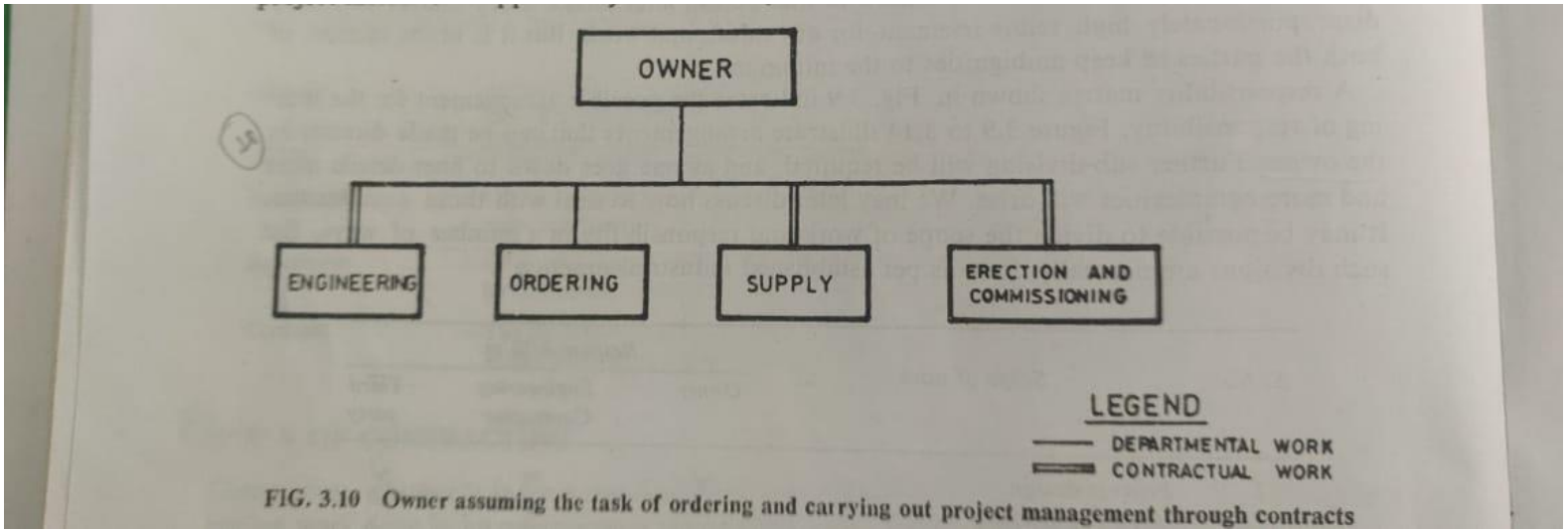


FIG. 3.10 Owner assuming the task of ordering and carrying out project management through contracts

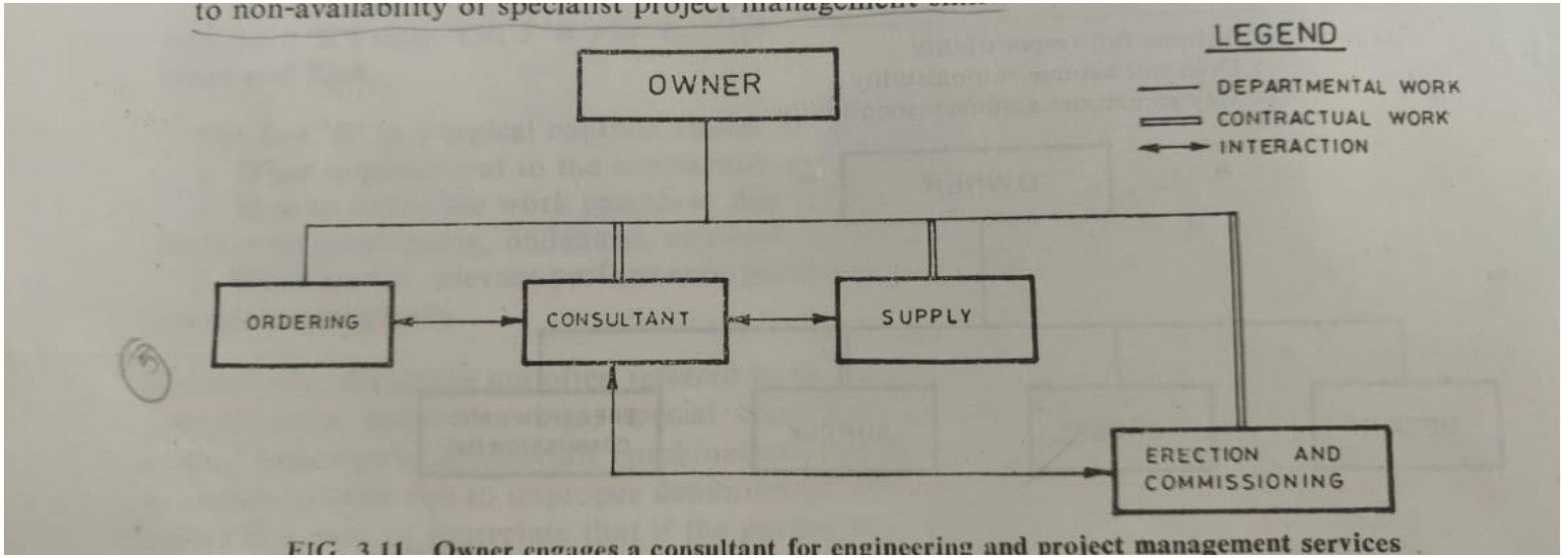


FIG. 3.11 Owner engages a consultant for engineering and project management services

RESPONSIBILITY MATRIX

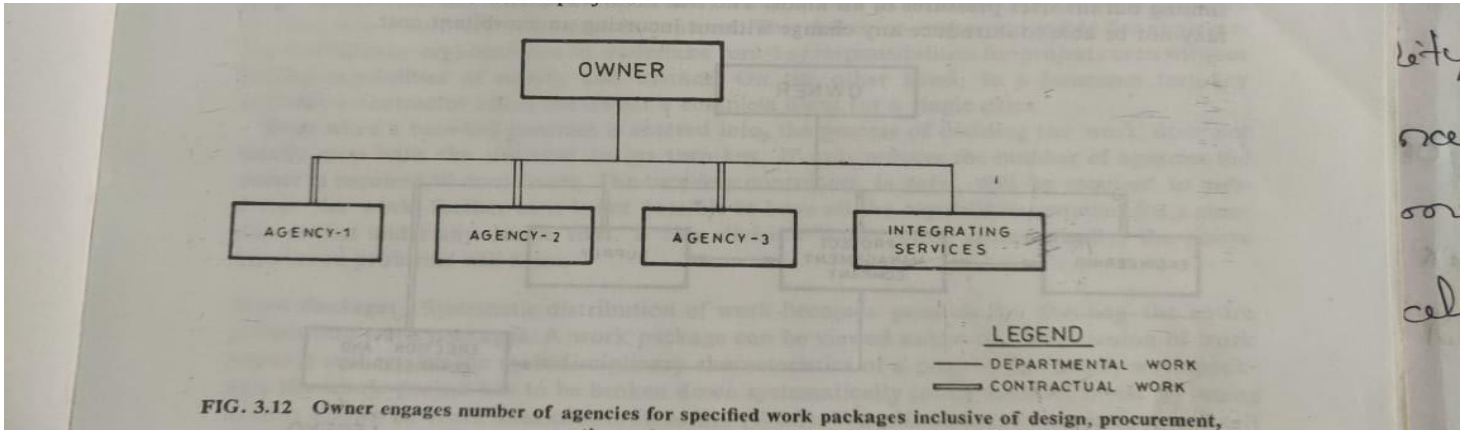


FIG. 3.12 Owner engages number of agencies for specified work packages inclusive of design, procurement,

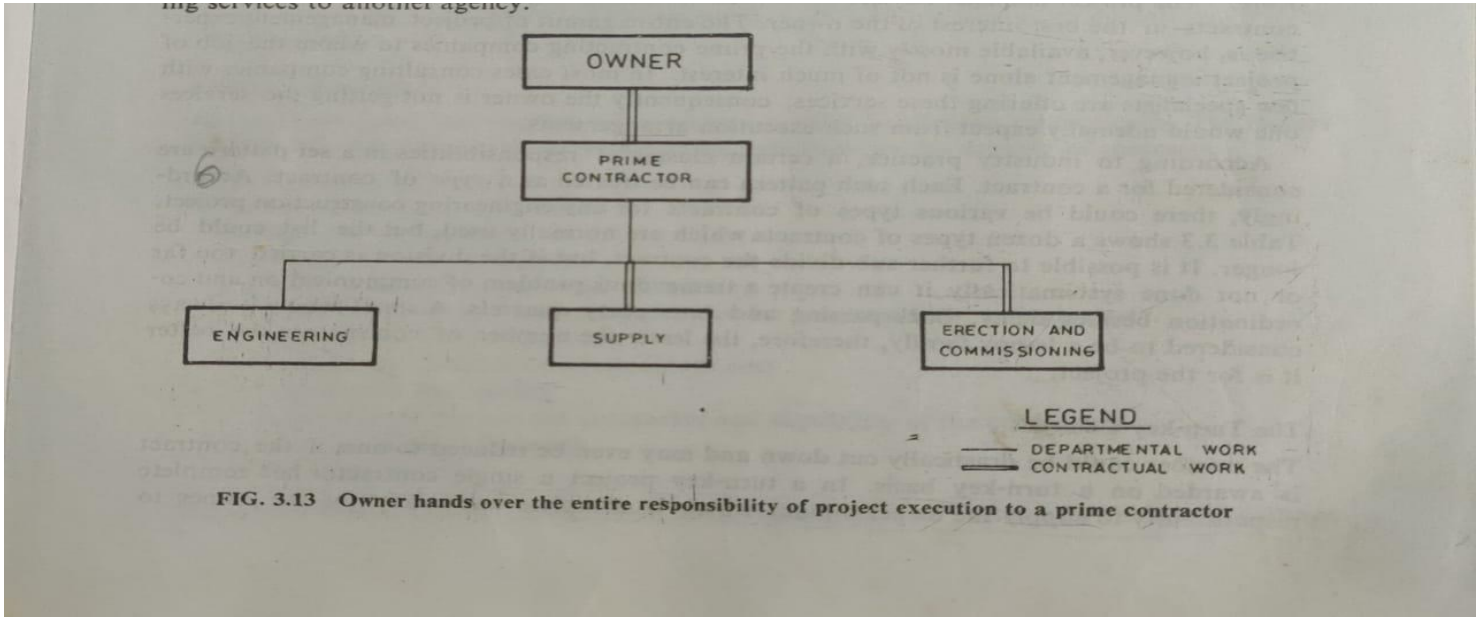


FIG. 3.13 Owner hands over the entire responsibility of project execution to a prime contractor

Responsibility matrix

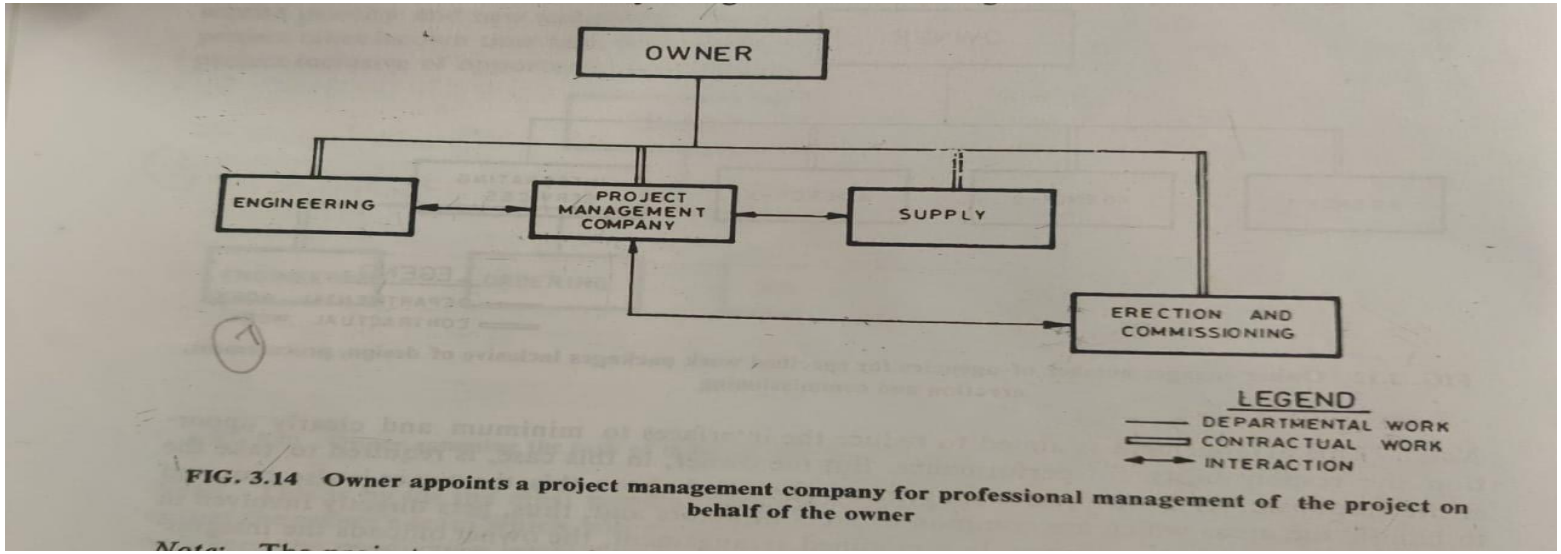


FIG. 3.14 Owner appoints a project management company for professional management of the project on behalf of the owner

2.REIMBUSMENT

TABLE 3.2 Types of reimbursement

S. No.	Types of reimbursement	Method of reimbursement
1.	**Lump sum contracts**	
	1.1 Lump sum	Fixed price arrived at by way of competitive bidding.
	1.2 Negotiated lump sum	A fixed price is negotiated with the contractor selected on consideration other than price.
2.	**Cost plus contracts**	
	2.1 Cost plus per cent fee	(a) For services: Actual man hour × rate = say A + % of A for overhead = say B, + agreed % (A + B) as fees + out of pocket cost at actuals. (b) For supply: Equipment costs at actuals + agreed % fee for service. (c) For turnkey project: Installed plant cost at actuals + agreed % fee for services.
	2.2 Cost puls fixed fee	Fee component is fixed and not linked with other costs which will be reimbursed at actuals.
	2.3 Cost plus with guaranteed maximum	Reimbursement to the contractor is on the basis of cost plus and % fee or fixed fee such that the total price does not exceed a predetermined amount. If the contractor incurred more cost than this figure to complete the work, some part of the extra cost will be borne by him.
	2.4 Cost plus with guaranteed maximum and incentive (Also known as target cost contracts)	Same as above except if the final cost is lower than the target, some part of the saving will be passed on the contractor. In both 2.3 and 2.4 escalation clause must be included to protect the contractor from developments beyond his control.
	2.5 Fixed rate contract	Contractor is reimbursed for his expenditures, measured in days or hours, at agreed rates per man hour or per man day without the total number of hours or days being fixed.
3.	**Item rate Contracts**	A detailed schedule of items giving brief description of the work or supplies with approximate quantity is introduced in the contract, and the contractor offers a unit rate against each item. Rates may also be obtained against items not quantified. Payment is made against the aggregate of various quantities actually executed at rates quoted by the contractors. Beyond a certain % variation in the quantity specified in the schedule or total values of the contract, rates may require to be renegotiated.
4.	**Convertible contracts**	Works on a cost-plus basis till scope of work can be defined and later converted to lumpsum.
5.	**Hybrid contracts**	
	5.1 Lump sum + item rate	The contract in such cases may be divided into two parts. The parts where design parameter and/or quantities are frozen are put on lumpsum. For the balance parts where quantities may change during detailed design, item rates are invited from the contractor against schedule of item with no or very rough quantities.

(Contd.)

5.2 Lump sum + cost plus	Same as above except that where the details of the second part cannot be even roughly estimated the same can be put on cost-plus.
5.3 Lump sum + fixed rate	The lump sum portion may refer to supplies, design or for such scope of work which can be fully defined. For services like commissioning or construction supervision or for escalated period reimbursement may be made at an agreed fixed rate.

change his mind at any stage without being forced to pay exorbitantly. The owner can also

TABLE 3.3 Type of contract vs reimbursement

S. No.	*Type of contract*	*Possible type of reimbursement*
1.	Process licensing contract	Lump sum
2.	Know-how contract	Lump sum
3.	Detailed engineering contract	Lump sum
4.	Project engineering contract	Lump sum + fixed rate
5.	Prime contract	Lump sum + cost plus
6.	System contract	Lumpsum
7.	Supply contract	Item rate
8.	Supply plus erection contract	Lump sum + fixed rate
9.	Construction/erection contract	Item rate
10.	Turnkey contract	Lump sum
11.	Project monitoring contract	Fixed rate
12.	Scheduling and monitoring contract	Lump sum
13.	Management contract	Lump sum
14.	Labour contract	Fixed rate

Identification of risks Let us identify the risks which either the owner or the contractor may face. What the owner is not certain about and, therefore, considers as a risk may be any of the following.

1. Will the contractor be able to carry out the work as per specifications?
2. Can the work be completed within the quoted cost?
3. Will the plant perform at the required level?
4. Will the contractor stay on the job till its completion?
5. Will the contractor adhere to the time schedule?
6. Will the contractor meet the owner's requirements if they are changed at a later date?
7. Will the contractor cooperate with the owner and third parties?
8. Will the party submitting the tender back out when the contract is awarded to him?
9. Will the contractor leave behind liability for the owner to deal with in regard to his staff or third parties?
10. Will the contractor rectify defects discovered after he leaves the scene?
11. Does the contractor understand his intent fully and interpret the contractual terms as the owner would?
12. If the relationship does not click, what can happen?

The contractor, similarly, is also not certain about many things. In particular, he carries the following risks in relation to the owner and would seek protection against the same in the contract:

1. Will the owner terminate his work before completion of the same?
2. Will the owner make payments promptly?

Risk

3. Will there be work hold-up and imposed idleness for him?
4. Will the owner carry certain minimum obligations regarding his work?
5. Will the owner change the scope of work upsetting his plan and estimates?
6. Will the work quantities and specifications change significantly affecting his rates?
7. Will he get reimbursed for extended work duration?
8. Will there be price escalation and will he get compensated for the same?
9. Will he be penalized for failures beyond his control?
10. Will there be smooth cash flow?
11. Will the owner provide workforce and other inputs in time for uninterrupted progress?
12. Will the plant or equipment be taken over when ready?
13. Will the owner honour extra claims?
14. Will there be difference in interpretation of his scope and responsibilities with the owner?
15. Can he make a profit?

General conditions of contract (GCC) To ensure that parties entering into a contract are appropriately protected against risks, various professional institutions have devised standard contract documents. It is advisable for the parties concerned to take up one of these documents for framing their contract rather than making one of their own. When published conditions of contract are used, they are likely to be more neutral than those made in-house which may be slanted either towards the owner or the contractor depending on who drafts the same. Use of published conditions of contract will also avoid unnecessary discussions which normally follow when in-house drafted conditions of contract are used.

The Institution of Mechanical Engineers (IME), U.K. has developed such forms for various types of work which have international acceptance. These forms, in fact, have been developed jointly by three institutions:

1. The Institution of Mechanical Engineers (IME)
2. The Institution of Electrical Engineers (IEE)
3. Association of Consulting Engineers (ACE)

In India the National Association of Consulting Engineers (NACE) has also developed standard forms which could be used for this purpose.

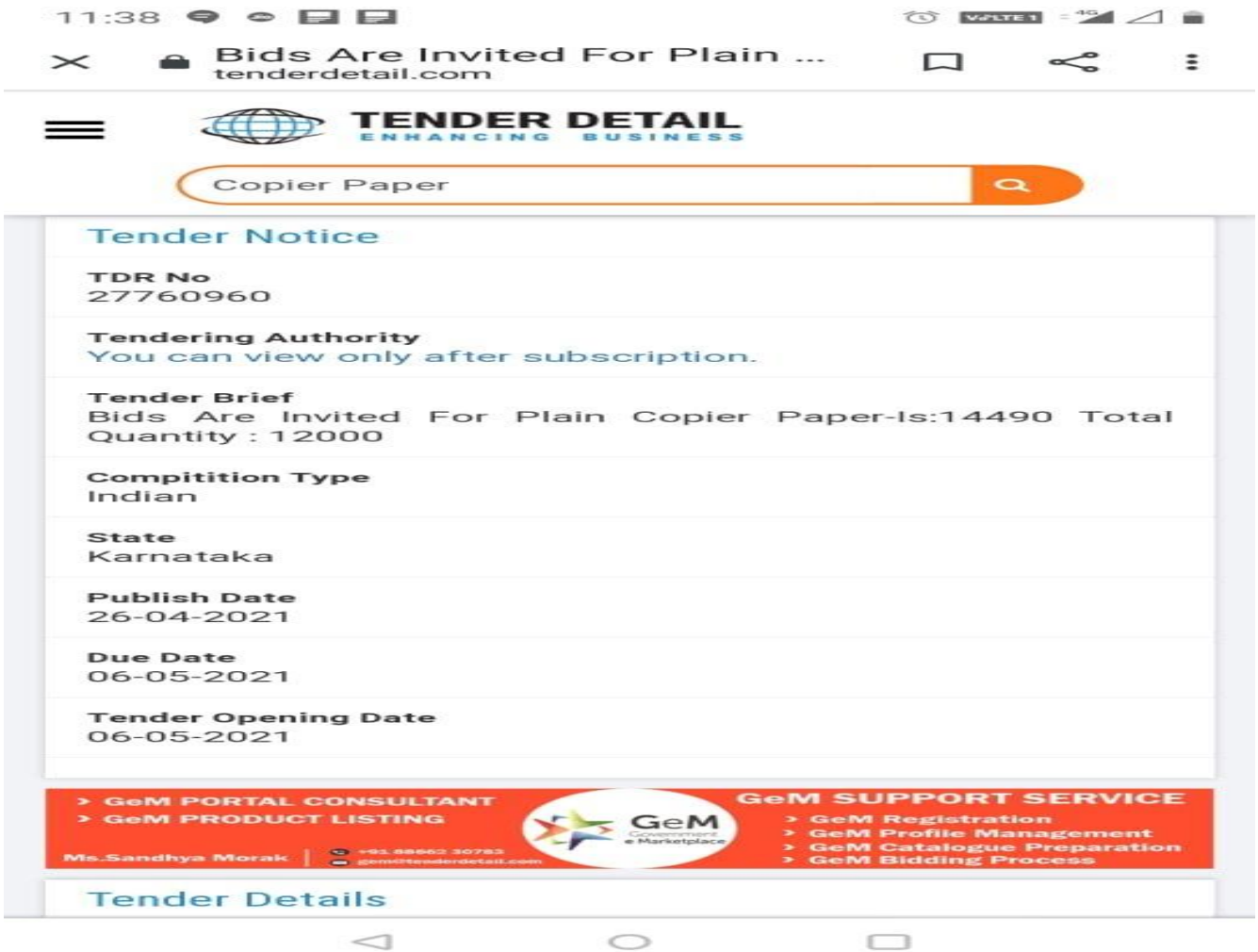
A model form usually contains various clauses which specify the exact position in respect of various risk factors. The various clauses in IME GCC for supply and erection of plant and machinery are reviewed below.

Clause 1 Definition of terms—This clause is supposed to remove the communication gap the parties may have in the interpretation of certain terms used in drafting a contract.

Clause 2 Contractor to inform himself fully—This clause is included to ensure that the contractor has examined the relevant data before bidding.

Clause 3 Security for due performance—This clause enables the owner to obtain security deposit or bank guarantee not exceeding 15% of the contract price at the start of work as an insurance for faithful performance of the contract.

Clause 4 Expenses of agreement—This clause names the party which will bear the expenses of the agreement.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Bids Are Invited For Plain ...
tenderdetail.com
TENDER DETAIL
ENHANCING BUSINESS
Copier Paper
Tender Notice
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Tender Brief
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Due Date
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GeM PORTAL CONSULTANT
GeM PRODUCT LISTING
Ms.Sandhya Morak
GeM
GeM SUPPORT SERVICE
GeM Registration
GeM Profile Management
GeM Catalogue Preparation
GeM Bidding Process
Tender Details

TENDERING AND SELECTION OF CONTRACTOR

It can, however, be appreciated that the GCC only lists provisions to protect against uncertainties arising in the normal course of work. Thus, a contract presumes that the parties entering into a contract are competent and normal. But if, for instance, the contractor selected for a specific work is not competent technically, financially or managerially, then the risks will multiply several times. This uncertainty must, therefore, be resolved at the first instance. A well laid out procedure for prequalification of contractors and tendering can resolve this uncertainty. Such a procedure is known as *tendering procedure*.

A *tender* may be defined as an offer to carry out certain work or supply certain material or services in accordance with clearly detailed descriptions and conditions. The tendering procedure deals with prequalification of contractors, preparation of tender documents, mode of floatation of enquiry, receipt of tender, guidelines for evaluation of tenders and selection of contractor. We will discuss this in some details in the context of reducing risk and uncertainty in the execution of a project.

Prequalification of Contractors

For prequalification of tenders, notifications are issued in the press, at embassies, etc. as appropriate giving details such as name of the purchaser/engineer, outline of the project, enquiry issue and tender submission dates, instructions for applying for prequalification and submission date for the contractor's prequalification data.

Normally, a prequalification document, issued on request to a contractor seeks information on the organization, experience in the intended type of work, availability of resources like managerial, technical, labour and plant, and also asks for financial statements. The contractor desirous of prequalification responds to the questionnaire and such details as may enable his qualification.

The data supplied by the contractors are evaluated for the preparation of a short list. The purchaser or his engineer would normally select a contractor for inclusion in the short list of tenders if:

1. He has had similar experience earlier and his performance reports for previous contracts are satisfactory.
2. His past turnover and present financial commitments indicate no constraint on fund availability for execution of the proposed contract.
3. He has the necessary infrastructure, adequate technical manpower, construction equipment and his present commitments would not prevent him from executing the proposed assignment satisfactorily.
4. His credibility in terms of his associates and associations with other agencies including foreign agencies, job performance and relationship with customers are sound.

After evaluation, the short-listed contractors are informed about their selection and their confirmation obtained as to whether they will submit the tender.

Preparation of Tender Documents

A tender document is prepared by the purchaser/engineer in as detailed and clear manner as possible to define the technical requirements of the work involved as also the responsibi-

lities which the purchaser and contractor will have to share between themselves. A good tender document will include the following:

1. Letter of invitation to tender
2. Instruction to tenderers
3. General conditions of contract
4. Technical specifications
5. Special conditions of contract
6. Scope drawings
7. Bill of quantities
8. General information about site
9. Form of tender

Professional institutions like IMechE have also standardized the tender form. A tender form for supply and erection of plant and machinery may cover the following items in the order listed below:

1. Prices
2. Programme
3. Terms of payment
4. Conditions of contract
5. Contract price adjustment
6. Validity

The document is then issued to the short-listed contractors for submission of their tender.

Receipt of Tenders

The tenderers may make a request to visit the site. Normally, the purchaser/engineer accompanies the tenderers to the site and provides further information. There may be a pre-bid conference to clarify the various issues to the tenderers. Supplementary queries can be clarified through correspondence till the due date for the bidding. On the due date bids may be opened in front of the tenderers present. The purchaser/engineer will announce and record the names of tenderers and prices including prices of alternative tenders. They would also announce and record the names to tenderers, if any, who are disqualified due to late submission.

Evaluation of Tenders

The tenders are evaluated from technical, commercial, contractual and managerial angles. Contractor's confirmation or clarifications are sought on various matters which either do not conform the tender requirements or those that have not been offered by the contractor. The correspondence may reduce the points of disagreement but a post-bid meeting often cannot be avoided. Normally, separate meetings are held with each contractor to obtain clarification and also to bring all the offers in line with the tender requirement.

The actual evaluation process includes checking the acceptability of the offer against technical specifications, management specification and various commercial and contractual terms and conditions. An adjusted contract price will be arrived at in each case. Normally, the lowest bidder who is also technically and managerially acceptable is awarded the contract.

Agreement An agreement is now to be signed on a stamped paper. The form of agreement is probably the most standardized document. The form of agreement refers to the various documents which will together form the contract. The accompanying documents normally are:

1. Original tender papers comprising the conditions of contract, specifications, dates, drawings and other relevant information.
2. Schedule of rates/prices, including those for engaging workmen, equipment, etc. for contingent works required during execution not envisaged at the tendering stage.
3. A list of deviations from original tender stipulations as mutually agreed upon between the purchaser and the contractor after discussions.
4. Other relevant attachments.

Form of Guarantee Finally, whenever required, a guarantee from sureties in the following standard form of IMechE may be asked from the contractor as an insurance against uncertainties in dealings with the contractor.

By an agreement dated and made between the purchaser and the contractor the parties enter into a contract as stated below:

> Now we hereby jointly and individually guarantee to the purchaser punctual, true and faithful performance and observance by the contractor of the covenant on his part contained in the said agreement and undertake to be responsible to the purchaser, his legal personal representatives, successors or assigns as sureties for the contractor for the payment by him of all sums of money losses, damages, cost charges and expenses that may become due or payable to the purchaser from the contractor in consequence of default in the performance. Nevertheless, the total amount to be demanded shall not exceed 15 per cent of the *contract price.*
>
> *This guarantee shall not be revocable by notice and our liabilities as sureties hereunder shall not be impaired by any alterations made or agreed to in the general conditions of contract.*

TEAM BUILDING

The greatest uncertainties, however, arise not from the scope of work or from the type of contract arrangement. The real source of uncertainties are the people themselves, irrespective of whether they have been brought into the project by contract arrangement or through in-house organizational arrangement. It can be easily appreciated that if the people are concerned more about their rights, which a contract aims to protect, and not about their responsibilities, which as we have discussed before, are more a matter of self-realization, then the project is not likely to show the best results.

A contract, at best, can record the responsibilities that parties must assume, stipulate the incentives or disincentives for fulfilment or non-fulfilment of the same but it cannot make them put the interest of the project before or at least at par with their own self-interest. Yet, it is absolutely necessary that the interest of the project becomes of primary concern for all the participants in a project, or else they will not be able to work together. When all the participants of the project put the project interest before their personal motives or at least at par with their self-consideration, and work hand-in-hand for the good of the project then the participants can be said to be working as a team.

If the people can be forged into a team, there would not be any need for an elaborate contract. On the other hand, any amount of contractual clauses cannot make a team and conse-